



SEQUENCE LISTING

<110> CLOUGH, BARBARA
PREISER, PETER
WILSON, ROBERT

<120> AN EF-TU PROTEIN ENCODED ON THE PLASTID DNA OF THE
MALARIA PARASITE AND PROTEIN SYNTHESIS INHIBITORS
EFFECTIVE AS ANTI-MALARIAL COMPOUNDS

<130> 117-349

<140> US 09/845,335

<141> 2001-05-01

<150> US 09/140,466

<151> 1998-08-26

<150> US 60/056,246

<151> 1997-08-28

<160> 14

<170> PatentIn Ver. 2.1

<210> 1

<211> 1230

<212> DNA

<213> Plasmodium falciparum

<220>

<221> CDS

<222> (1)..(1230)

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act ata ggg cat gta gat cat gga aaa act aca tta aca aca gct ata 96
Thr Ile Gly His Val Asp His Gly Lys Thr Thr Leu Thr Thr Ala Ile
      20             25             30
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tct tat tta tta aat tta caa gga tta tca aaa aaa tat aat tat tca 144
Ser Tyr Leu Leu Asn Leu Gln Gly Leu Ser Lys Lys Tyr Asn Tyr Ser
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gat att gat tca gct cca gaa gaa aaa ata aga ggt att aca ata aat	192
Asp Ile Asp Ser Ala Pro Glu Glu Lys Ile Arg Gly Ile Thr Ile Asn	
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aca aca cat att gaa tat gaa act tta aca aaa cat tgt gct cat ata	240
Thr Thr His Ile Glu Tyr Glu Thr Leu Thr Lys His Cys Ala His Ile	
65 70 75 80	
gat tgt cca gga cat tcc gat tat att aaa aat atg att ata gga gcc	288
Asp Cys Pro Gly His Ser Asp Tyr Ile Lys Asn Met Ile Ile Gly Ala	
85 90 95	
aca caa atg gat ata gca att tta gta ata tct ata ata gat ggt ata	336
Thr Gln Met Asp Ile Ala Ile Leu Val Ile Ser Ile Ile Asp Gly Ile	
100 105 110	
atg cct caa act tat gaa cat tta tta tta ata aaa caa ata ggt ata	384
Met Pro Gln Thr Tyr Glu His Leu Leu Leu Ile Lys Gln Ile Gly Ile	
115 120 125	
aaa aat ata att att ttt tta aat aaa gaa gat tta tgt gat gat gtt	432
Lys Asn Ile Ile Ile Phe Leu Asn Lys Glu Asp Leu Cys Asp Asp Val	
130 135 140	
gaa tta ata gat ttt ata aaa tta gaa gta aat gaa tta tta att aaa	480
Glu Leu Ile Asp Phe Ile Lys Leu Glu Val Asn Glu Leu Leu Ile Lys	
145 150 155 160	
tat aat ttt gat tta aat tat ata cat ata tta act ggt tca gca tta	528
Tyr Asn Phe Asp Leu Asn Tyr Ile His Ile Leu Thr Gly Ser Ala Leu	
165 170 175	
aat gta ata aat ata att caa aaa aat aag gat tat gaa tta ata aaa	576
Asn Val Ile Asn Ile Ile Gln Lys Asn Lys Asp Tyr Glu Leu Ile Lys	
180 185 190	
tct aat att tgg ata caa aaa tta aat aat tta att caa ata att gat	624
Ser Asn Ile Trp Ile Gln Lys Leu Asn Asn Leu Ile Gln Ile Ile Asp	
195 200 205	
aat att ata ata cct act aga aaa att aat gat tac ttt tta atg tca	672
Asn Ile Ile Ile Pro Thr Arg Lys Ile Asn Asp Tyr Phe Leu Met Ser	
210 215 220	

ata gaa gat gta ttt tct ata aca ggt aga ggt aca gta gta aca ggt Ile Glu Asp Val Phe Ser Ile Thr Gly Arg Gly Thr Val Val Thr Gly 225 230 235 240	720
aag att gaa caa gga tgt ata aat tta aat gat gaa att gaa att tta Lys Ile Glu Gln Gly Cys Ile Asn Leu Asn Asp Glu Ile Glu Ile Leu 245 250 255	768
aaa ttt gaa aaa tca tct cct aat tta aca aca gtt ata gga tta gaa Lys Phe Glu Lys Ser Ser Pro Asn Leu Thr Thr Val Ile Gly Leu Glu 260 265 270	816
atg ttt aaa aaa caa tta aca caa gca caa tcc gga gat aat gta ggt Met Phe Lys Lys Gln Leu Thr Gln Ala Gln Ser Gly Asp Asn Val Gly 275 280 285	864
att tta tta aga aat att caa aaa aaa gat ata aaa aga ggt atg att Ile Leu Leu Arg Asn Ile Gln Lys Lys Asp Ile Lys Arg Gly Met Ile 290 295 300	912
tta gca aca cct aat aaa tta aaa gta tat aag tct ttt ata gct gaa Leu Ala Thr Pro Asn Lys Leu Lys Val Tyr Lys Ser Phe Ile Ala Glu 305 310 315 320	960
aca tat att tta act aaa gaa gaa ggt ggt cgt cat aaa cct ttt aat Thr Tyr Ile Leu Thr Lys Glu Glu Gly Gly Arg His Lys Pro Phe Asn 325 330 335	1008
att gga tat aaa cct caa ttt ttt att cgt aca gta gat gtt act gga Ile Gly Tyr Lys Pro Gln Phe Phe Ile Arg Thr Val Asp Val Thr Gly 340 345 350	1056
gaa att aaa aat ata tat tta aat gaa aat gta caa aaa gta gct ata Glu Ile Lys Asn Ile Tyr Leu Asn Glu Asn Val Gln Lys Val Ala Ile 355 360 365	1104
cct gga gat aaa ata aca tta cat att gaa tta aaa cat tat ata gtg Pro Gly Asp Lys Ile Thr Leu His Ile Glu Leu Lys His Tyr Ile Val 370 375 380	1152
ttg aca tta aat atg aaa ttt tct att aga gaa gga gga aaa aca ata Leu Thr Leu Asn Met Lys Phe Ser Ile Arg Glu Gly Gly Lys Thr Ile 385 390 395 400	1200

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1230

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 Ser Tyr Leu Leu Asn Leu Gln Gly Leu Ser Lys Lys Tyr Asn Tyr Ser
 35 40 45
 Asp Ile Asp Ser Ala Pro Glu Glu Lys Ile Arg Gly Ile Thr Ile Asn
 50 55 60
 Thr Thr His Ile Glu Tyr Glu Thr Leu Thr Lys His Cys Ala His Ile
 65 70 75 80
 Asp Cys Pro Gly His Ser Asp Tyr Ile Lys Asn Met Ile Ile Gly Ala
 85 90 95
 Thr Gln Met Asp Ile Ala Ile Leu Val Ile Ser Ile Ile Asp Gly Ile
 100 105 110
 Met Pro Gln Thr Tyr Glu His Leu Leu Leu Ile Lys Gln Ile Gly Ile
 115 120 125
 Lys Asn Ile Ile Ile Phe Leu Asn Lys Glu Asp Leu Cys Asp Asp Val
 130 135 140
 Glu Leu Ile Asp Phe Ile Lys Leu Glu Val Asn Glu Leu Leu Ile Lys
 145 150 155 160
 Tyr Asn Phe Asp Leu Asn Tyr Ile His Ile Leu Thr Gly Ser Ala Leu
 165 170 175

Asn Val Ile Asn Ile Ile Gln Lys Asn Lys Asp Tyr Glu Leu Ile Lys
 180 185 190
 Ser Asn Ile Trp Ile Gln Lys Leu Asn Asn Leu Ile Gln Ile Ile Asp
 195 200 205
 Asn Ile Ile Ile Pro Thr Arg Lys Ile Asn Asp Tyr Phe Leu Met Ser
 210 215 220
 Ile Glu Asp Val Phe Ser Ile Thr Gly Arg Gly Thr Val Val Thr Gly
 225 230 235 240
 Lys Ile Glu Gln Gly Cys Ile Asn Leu Asn Asp Glu Ile Glu Ile Leu
 245 250 255
 Lys Phe Glu Lys Ser Ser Pro Asn Leu Thr Thr Val Ile Gly Leu Glu
 260 265 270
 Met Phe Lys Lys Gln Leu Thr Gln Ala Gln Ser Gly Asp Asn Val Gly
 275 280 285
 Ile Leu Leu Arg Asn Ile Gln Lys Lys Asp Ile Lys Arg Gly Met Ile
 290 295 300
 Leu Ala Thr Pro Asn Lys Leu Lys Val Tyr Lys Ser Phe Ile Ala Glu
 305 310 315 320
 Thr Tyr Ile Leu Thr Lys Glu Glu Gly Gly Arg His Lys Pro Phe Asn
 325 330 335
 Ile Gly Tyr Lys Pro Gln Phe Phe Ile Arg Thr Val Asp Val Thr Gly
 340 345 350
 Glu Ile Lys Asn Ile Tyr Leu Asn Glu Asn Val Gln Lys Val Ala Ile
 355 360 365
 Pro Gly Asp Lys Ile Thr Leu His Ile Glu Leu Lys His Tyr Ile Val
 370 375 380
 Leu Thr Leu Asn Met Lys Phe Ser Ile Arg Glu Gly Gly Lys Thr Ile
 385 390 395 400
 Gly Ala Gly Ile Ile Thr Glu Ile Lys Asn

405

410

<210> 3

<211> 409

<212> PRT

<213> *Anacystis nidulans*

<400> 3

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 20 25 30

Thr Thr Val Leu Ala Lys Ala Gly Met Ala Lys Ala Arg Ala Tyr Ala
 35 40 45

Asp Ile Asp Ala Ala Pro Glu Glu Lys Ala Arg Gly Ile Thr Ile Asn
 50 55 60

Thr Ala His Val Glu Tyr Glu Thr Gly His Arg His Tyr Ala His Val
 65 70 75 80

Asp Cys Pro Gly His Ala Asp Tyr Val Lys Asn Met Ile Thr Gly Ala
 85 90 95

Ala Gln Met Asp Gly Ala Ile Leu Val Val Ser Ala Ala Asp Gly Pro
 100 105 110

Met Pro Gln Thr Arg Glu His Ile Leu Leu Ala Lys Gln Val Gly Val
 115 120 125

Pro Asn Ile Val Val Phe Leu Asn Lys Glu Asp Met Val Asp Asp Ala
 130 135 140

Glu Leu Leu Glu Leu Val Glu Leu Glu Val Arg Glu Leu Leu Ser Ser
 145 150 155 160

Tyr Asp Phe Pro Gly Asp Asp Ile Pro Ile Val Ala Gly Ser Ala Leu
 165 170 175

Gln Ala Leu Glu Ala Ile Gln Gly Gly Ala Ser Gly Gln Lys Gly Asp
 180 185 190
 Asn Pro Trp Val Asp Lys Ile Leu Lys Leu Met Glu Glu Val Asp Ala
 195 200 205
 Tyr Ile Pro Thr Pro Glu Arg Glu Val Asp Arg Pro Phe Leu Met Ala
 210 215 220
 Val Glu Asp Val Phe Thr Ile Thr Gly Arg Gly Thr Val Ala Thr Gly
 225 230 235 240
 Arg Ile Glu Arg Gly Ser Val Lys Val Gly Glu Thr Ile Glu Ile Val
 245 250 255
 Gly Leu Arg Asp Thr Arg Ser Thr Thr Val Thr Gly Val Glu Met Phe
 260 265 270
 Gln Lys Thr Leu Asp Glu Gly Leu Ala Gly Asp Asn Val Gly Leu Leu
 275 280 285
 Leu Arg Gly Ile Gln Lys Thr Asp Ile Glu Arg Gly Met Val Leu Ala
 290 295 300
 Lys Pro Gly Ser Ile Thr Pro His Thr Lys Phe Glu Ser Glu Val Tyr
 305 310 315 320
 Val Leu Lys Lys Glu Glu Gly Gly Arg His Thr Pro Phe Phe Pro Gly
 325 330 335
 Tyr Arg Pro Gln Phe Tyr Val Arg Thr Thr Asp Val Thr Gly Ala Ile
 340 345 350
 Ser Asp Phe Thr Ala Asp Asp Gly Ser Ala Ala Glu Met Val Ile Pro
 355 360 365
 Gly Asp Arg Ile Lys Met Thr Val Glu Leu Ile Asn Pro Ile Ala Ile
 370 375 380
 Glu Gln Gly Met Arg Phe Ala Ile Arg Glu Gly Gly Arg Thr Ile Gly
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<210> 4

<211> 408

<212> PRT

<213> Cryptomonas phi

<400> 4

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 35 40 45

Ile Asp Ser Ala Pro Glu Glu Lys Ala Arg Gly Ile Thr Ile Asn Thr
 50 55 60

Ala His Val Glu Tyr Glu Thr Asp Lys Trp Tyr Tyr Ala His Val Asp
 65 70 75 80

Cys Pro Gly His Ala Asp Tyr Val Lys Asn Met Ile Thr Gly Ala Ala
 85 90 95

Gln Met Asp Gly Ala Ile Leu Val Cys Ser Ala Ala Asn Gly Pro Met
 100 105 110

Pro Gln Thr Arg Glu His Ile Leu Leu Ala Lys Gln Val Gly Val Pro
 115 120 125

Tyr Ile Val Val Phe Leu Asn Lys Ala Asp Met Val Asp Asp Glu Glu
 130 135 140

Leu Leu Glu Leu Val Gln Leu Glu Val Gln Glu Leu Leu Glu Lys Tyr
 145 150 155 160

Asp Phe Pro Gly Ser Glu Ile Pro Phe Val Ala Gly Ser Ala Leu Leu
 165 170 175

Ala Leu Glu Ala Val Ala Asn Asn Pro Thr Ile Lys Arg Gly Glu Asp
 180 185 190

Lys Trp Val Asp Thr Ile Tyr Gln Leu Met Asp Lys Val Asp Glu Tyr
 195 200 205

Ile Pro Thr Pro Glu Arg Glu Thr Asp Lys Ala Phe Leu Met Ala Val
 210 215 220

Glu Asp Val Phe Ser Ile Thr Gly Arg Gly Thr Val Ala Thr Gly Arg
 225 230 235 240

Ile Glu Arg Gly Lys Val Lys Val Gly Asp Thr Ile Glu Ile Val Gly
 245 250 255

Leu Arg Glu Thr Arg Asn Thr Thr Ile Thr Gly Leu Glu Met Phe Gln
 260 265 270

Lys Ser Leu Asp Glu Ala Leu Ala Gly Asp Asn Val Gly Ile Leu Val
 275 280 285

Arg Gly Ile Gln Lys Thr Asp Ile Glu Arg Gly Met Val Leu Ala Ala
 290 295 300

Pro Gly Ser Ile Thr Pro His Thr Lys Phe Glu Gly Glu Val Tyr Val
 305 310 315 320

Leu Thr Lys Glu Glu Gly Gly Arg His Thr Pro Phe Phe Ser Gly Tyr
 325 330 335

Arg Pro Gln Phe Tyr Val Arg Thr Thr Asp Val Thr Gly Thr Ile Ala
 340 345 350

Gln Phe Thr Ser Asp Asp Gly Ser Thr Ala Glu Met Val Met Pro Gly
 355 360 365

Asp Arg Ile Lys Met Thr Ala Gln Leu Ile His Pro Ile Ala Ile Glu
 370 375 380

Lys Gly Met Arg Phe Ala Ile Arg Glu Gly Gly Arg Thr Val Gly Ala
 385 390 395 400

Gly Val Val Ser Lys Ile Ile Glu

<210> 5
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 <212> PRT
 <213> *Cyanophora paradoxa*

<400> 5

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			20					25					30		
Thr	Thr	Ala	Leu	Ala	Ser	Gln	Gly	Lys	Gly	Lys	Ala	Arg	Lys	Tyr	Asp
		35					40					45			
Glu	Ile	Asp	Ala	Ala	Pro	Glu	Glu	Lys	Ala	Arg	Gly	Ile	Thr	Ile	Asn
	50					55					60				
Thr	Ala	His	Val	Glu	Tyr	Glu	Thr	Glu	Lys	Arg	His	Tyr	Ala	His	Val
	65				70					75					80
Asp	Cys	Pro	Gly	His	Ala	Asp	Tyr	Val	Lys	Asn	Met	Ile	Thr	Gly	Ala
				85					90					95	
Ala	Gln	Met	Asp	Gly	Ala	Ile	Leu	Val	Val	Ser	Ala	Ala	Asp	Gly	Pro
			100				105						110		
Met	Pro	Gln	Thr	Arg	Glu	His	Ile	Leu	Leu	Ala	Lys	Gln	Val	Gly	Val
		115					120					125			
Pro	Asn	Met	Val	Val	Phe	Leu	Asn	Lys	Glu	Asp	Gln	Ile	Asp	Asp	Ala
		130				135					140				
Asp	Leu	Leu	Glu	Leu	Val	Glu	Leu	Glu	Val	Arg	Glu	Leu	Leu	Ser	Lys
145				150						155					160
Tyr	Asp	Phe	Pro	Gly	Asp	Gln	Ile	Pro	Phe	Val	Ser	Gly	Ser	Ala	Leu
				165					170					175	

Leu Ala Leu Glu Ser Leu Ser Ser Asn Pro Lys Leu Met Arg Gly Glu
 180 185 190
 Asp Lys Trp Val Asp Lys Ile Leu Ala Leu Met Asp Ala Val Asp Glu
 195 200 205
 Tyr Ile Pro Thr Pro Glu Arg Pro Ile Asp Lys Ser Phe Leu Met Ala
 210 215 220
 Ile Glu Asp Val Phe Ser Ile Thr Gly Arg Gly Thr Val Ala Thr Gly
 225 230 235 240
 Arg Ile Glu Arg Gly Ala Ile Lys Val Gly Glu Thr Val Glu Leu Val
 245 250 255
 Gly Leu Lys Asp Thr Lys Ser Thr Thr Val Thr Gly Leu Glu Met Phe
 260 265 270
 Gln Lys Thr Leu Glu Glu Gly Met Ala Gly Asp Asn Ile Gly Ile Leu
 275 280 285
 Leu Arg Gly Val Gln Lys Thr Asp Ile Glu Arg Gly Met Val Leu Ala
 290 295 300
 Lys Pro Gly Ser Ile Thr Pro His Thr Gln Phe Glu Ser Glu Val Tyr
 305 310 315 320
 Val Leu Thr Lys Asp Glu Gly Gly Arg His Thr Pro Phe Phe Ser Gly
 325 330 335
 Tyr Arg Pro Gln Phe Tyr Val Arg Thr Thr Asp Val Thr Gly Ser Ile
 340 345 350
 Asp Ala Phe Thr Ala Asp Asp Gly Ser Asn Ala Glu Met Val Met Pro
 355 360 365
 Gly Asp Arg Ile Lys Met Thr Val Ser Leu Val His Pro Ile Ala Ile
 370 375 380
 Glu Gln Gly Met Arg Phe Arg Ile Arg Glu Gly Gly Arg Thr Ile Gly
 385 390 395 400
 Ala Gly Val Val Ser Lys Ile Leu Lys

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<211> 394

<212> PRT

<213> Escherichia coli

<400> 6

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Thr Ile Gly His Val Asp His Gly Lys Thr Thr Leu Thr Ala Ala Ile
 20 25 30

Thr Thr Val Leu Ala Lys Thr Tyr Gly Gly Ala Ala Arg Ala Phe Asp
 35 40 45

Gln Ile Asp Asn Ala Pro Glu Glu Lys Ala Arg Gly Ile Thr Ile Asn
 50 55 60

Thr Ser His Val Glu Tyr Asp Thr Pro Thr Arg His Tyr Ala His Val
 65 70 75 80

Asp Cys Pro Gly His Ala Asp Tyr Val Lys Asn Met Ile Thr Gly Ala
 85 90 95

Ala Gln Met Asp Gly Ala Ile Leu Val Val Ala Ala Thr Asp Gly Pro
 100 105 110

Met Pro Gln Thr Arg Glu His Ile Leu Leu Gly Arg Gln Val Gly Val
 115 120 125

Pro Tyr Ile Ile Val Phe Leu Asn Lys Cys Asp Met Val Asp Asp Glu
 130 135 140

Glu Leu Leu Glu Leu Val Glu Met Glu Val Arg Glu Leu Leu Ser Gln
 145 150 155 160

Tyr Asp Phe Pro Gly Asp Asp Thr Pro Ile Val Arg Gly Ser Ala Leu
 165 170 175

Lys Ala Leu Glu Gly Asp Ala Glu Trp Glu Ala Lys Ile Leu Glu Leu
 180 185 190

Ala Gly Phe Leu Asp Ser Tyr Ile Pro Glu Pro Glu Arg Ala Ile Asp
 195 200 205

Lys Pro Phe Leu Leu Pro Ile Glu Asp Val Phe Ser Ile Ser Gly Arg
 210 215 220

Gly Thr Val Val Thr Gly Arg Val Glu Arg Gly Ile Ile Lys Val Gly
 225 230 235 240

Glu Glu Val Glu Ile Val Gly Ile Lys Glu Thr Gln Lys Ser Thr Cys
 245 250 255

Thr Gly Val Glu Met Phe Arg Lys Leu Leu Asp Glu Gly Arg Ala Gly
 260 265 270

Glu Asn Val Gly Val Leu Leu Arg Gly Ile Lys Arg Glu Glu Ile Glu
 275 280 285

Arg Gly Gln Val Leu Ala Lys Pro Gly Thr Ile Lys Pro His Thr Lys
 290 295 300

Phe Glu Ser Glu Val Tyr Ile Leu Ser Lys Asp Glu Gly Gly Arg His
 305 310 315 320

Thr Pro Phe Phe Lys Gly Tyr Arg Pro Gln Phe Tyr Phe Arg Thr Thr
 325 330 335

Asp Val Thr Gly Thr Ile Glu Leu Pro Glu Gly Val Glu Met Val Met
 340 345 350

Pro Gly Asp Asn Ile Lys Met Val Val Thr Leu Ile His Pro Ile Ala
 355 360 365

Met Asp Asp Gly Leu Arg Phe Ala Ile Arg Glu Gly Gly Arg Thr Val
 370 375 380

Gly Ala Gly Val Val Ala Lys Val Leu Ser
 385 390

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<212> PRT
<213> Plasmodium falciparum

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<210> 8
<211> 58
<212> RNA
<213> Plasmodium falciparum

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<210> 9
<211> 58
<212> RNA
<213> Plasmodium falciparum

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<210> 10
<211> 58
<212> RNA
<213> Plasmodium falciparum

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<210> 11
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<212> RNA
<213> Toxoplasma gondii

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<213> Escherichia coli

<400> 12
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<211> 4
<212> PRT
<213> Escherichia coli

<400> 13
Asp Cys Pro Gly
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<210> 14
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<213> Escherichia coli

<400> 14
Asn Lys Cys Asp
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